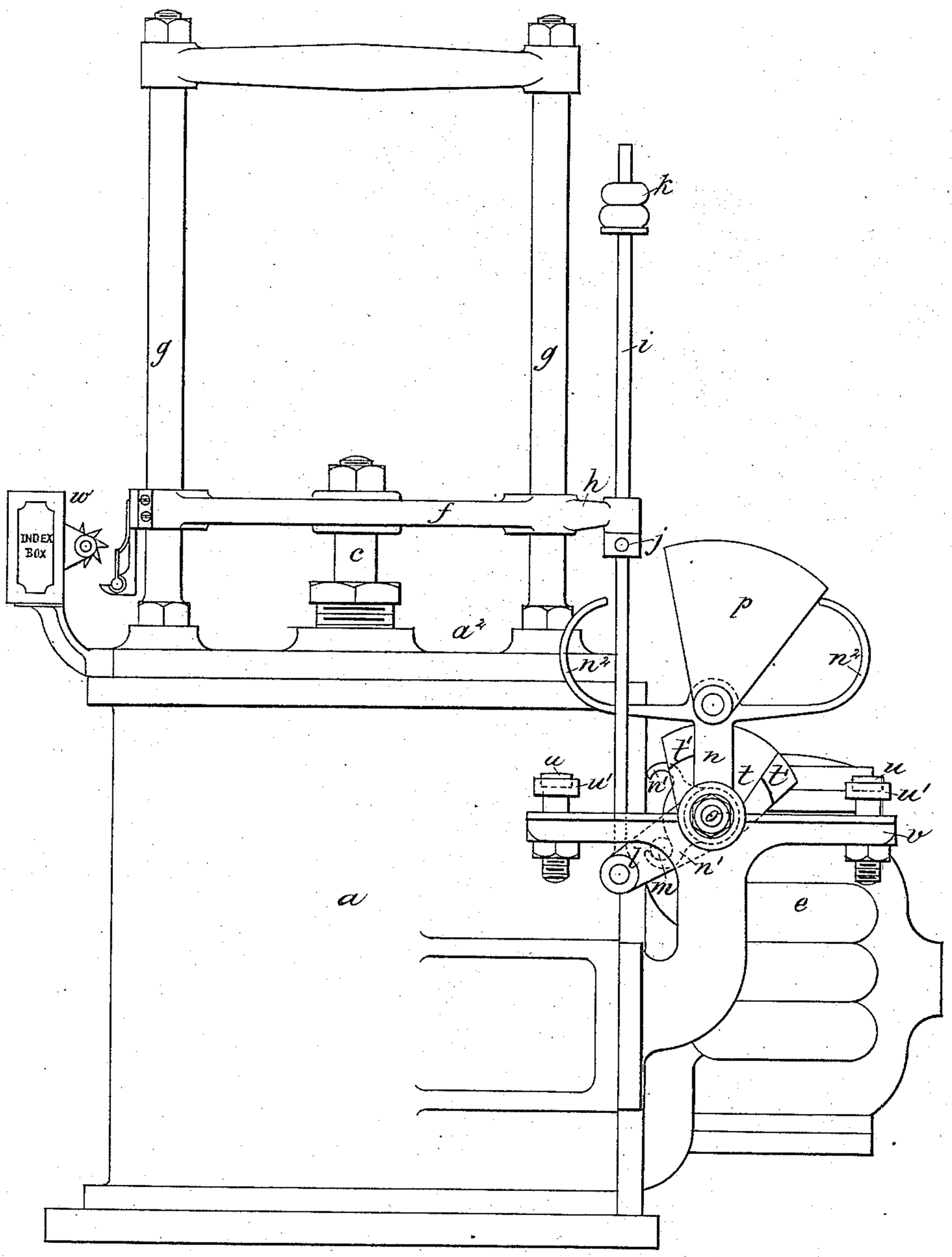
(No Model.) 4 Sheets—Sheet 1.

R. FRASER & W. CLARK.

WATER METER.

No. 309,340. Patented Dec. 16, 1884.

Fig. 1.



Witnesses,

Jo. L. Coombs

Robt Everett,

Inventors.
Robert Fraser.
William Clark.
By James L. Norris.
Atty.

(No Model.)

4 Sheets—Sheet 2.

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Fig. 3.

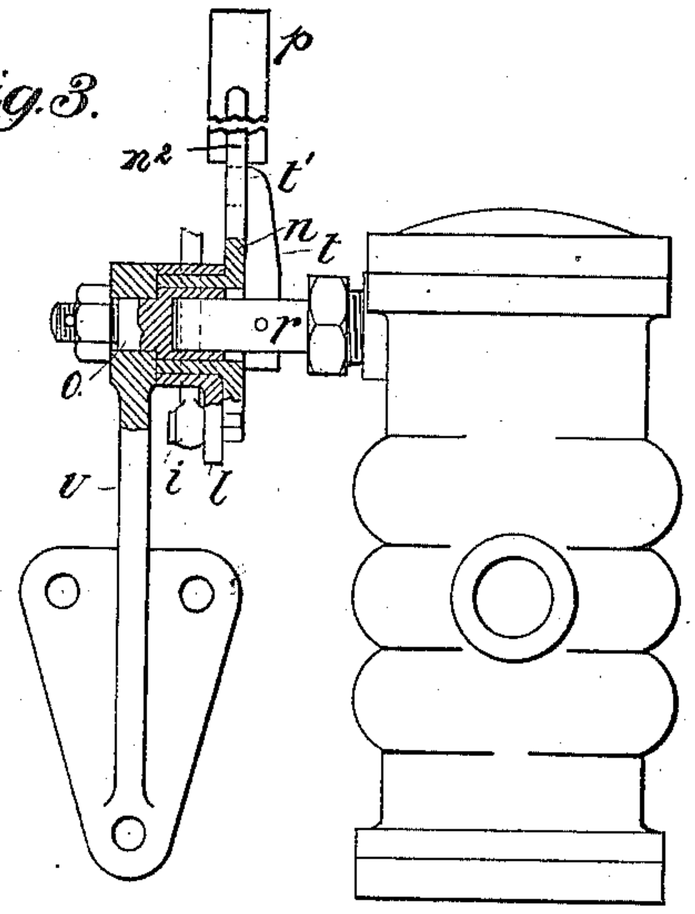
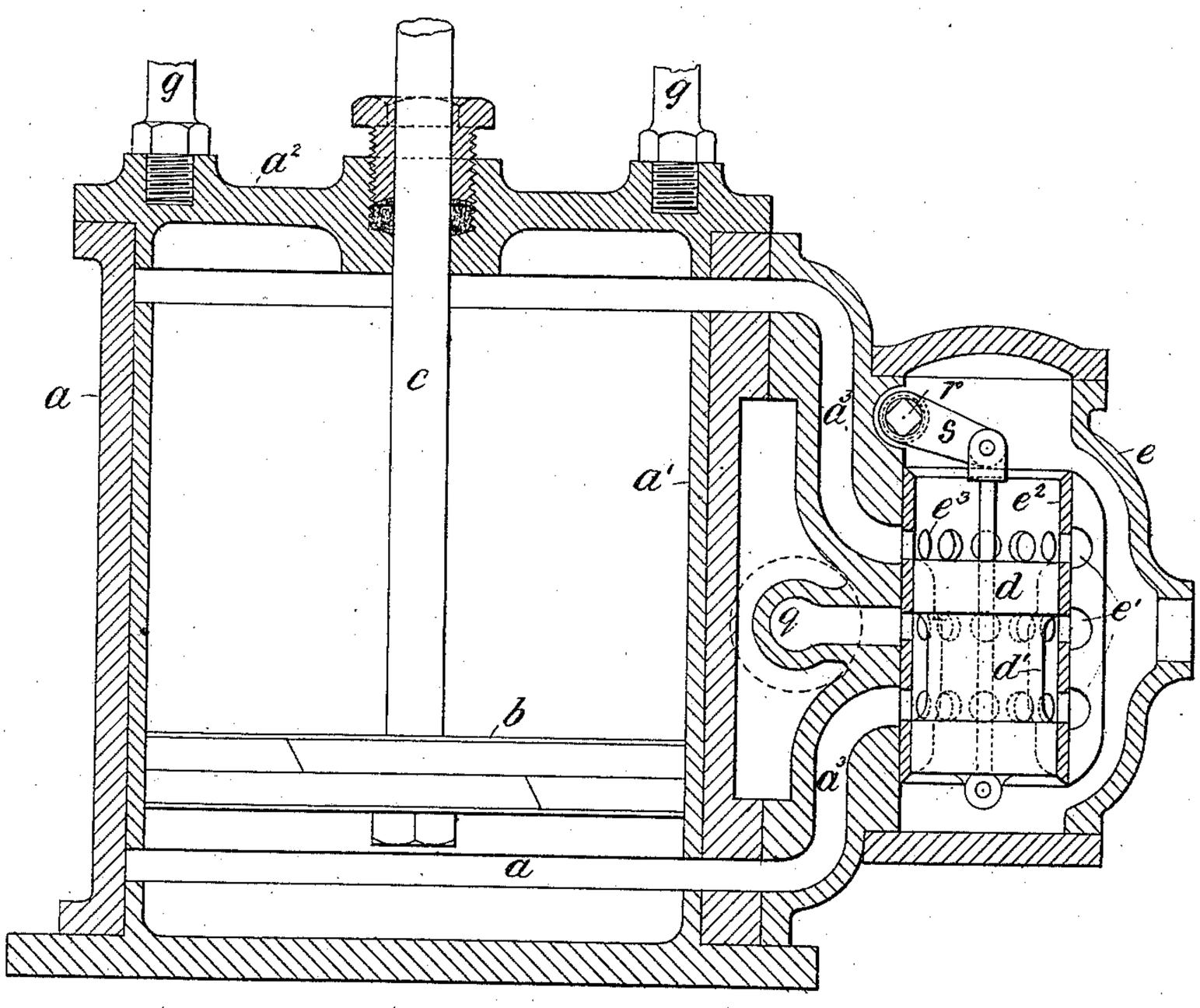


Fig. 2.



Witnesses,
Jo. L. Coomes
Robt Everett.

Inventors,
Robert Fraser,
William Clark,
By James L. Norris,
Atty.

(No Model.) 4 Sheets—Sheet 3.

R. FRASER & W. CLARK.

WATER METER.

No. 309,340. Patented Dec. 16, 1884.

Fig. 4.

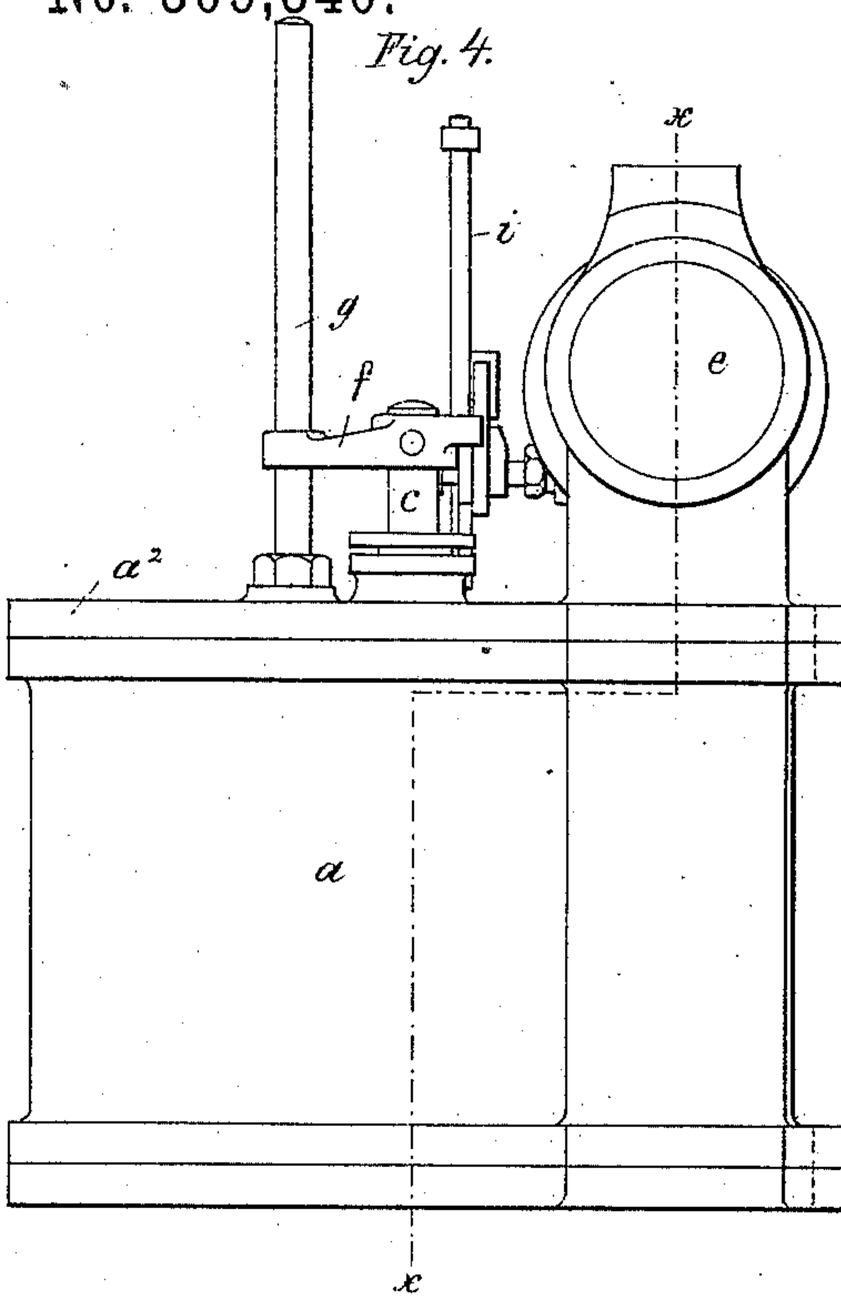


Fig. 6.

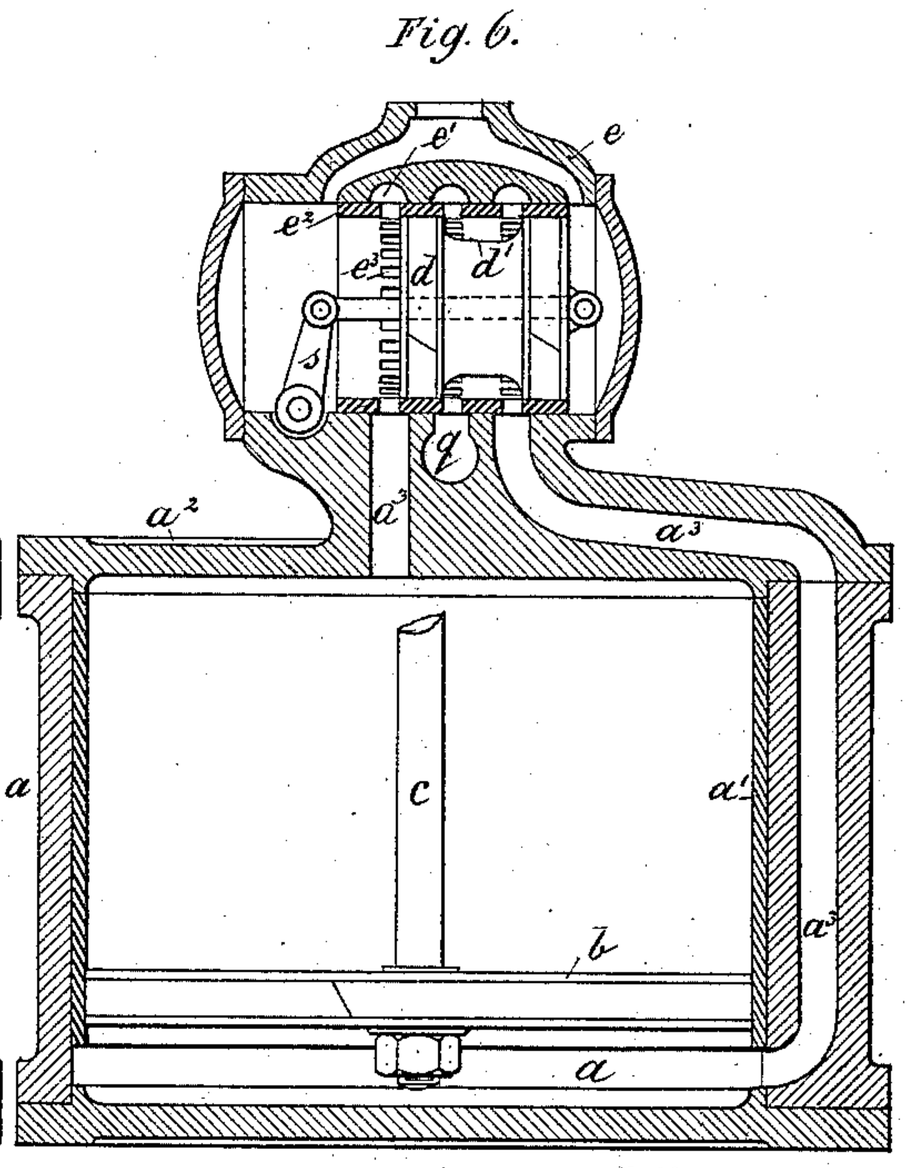
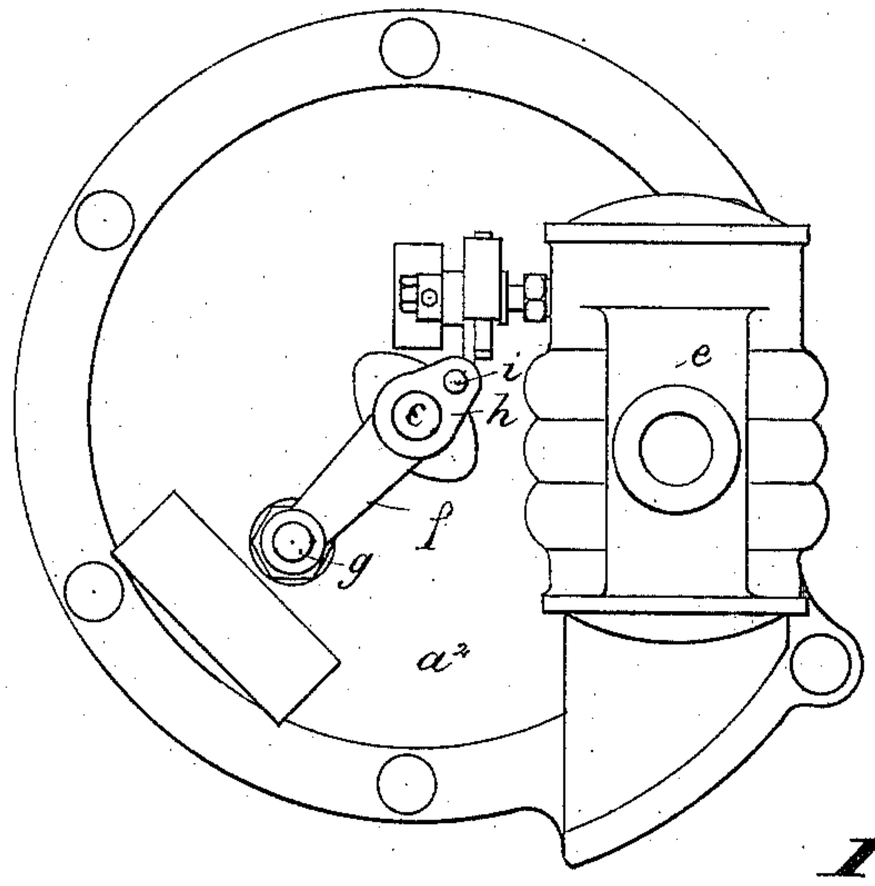


Fig. 5.



Witnesses.

Jo. L. Coombs

Robert Emett.

Inventors.

Robert Fraser.

William Clark.

By James L. Norris.

Atty.

(No Model.) 4 Sheets—Sheet 4.

R. FRASER & W. CLARK.

WATER METER.

No. 309,340. Patented Dec. 16, 1884.

Fig. 1.

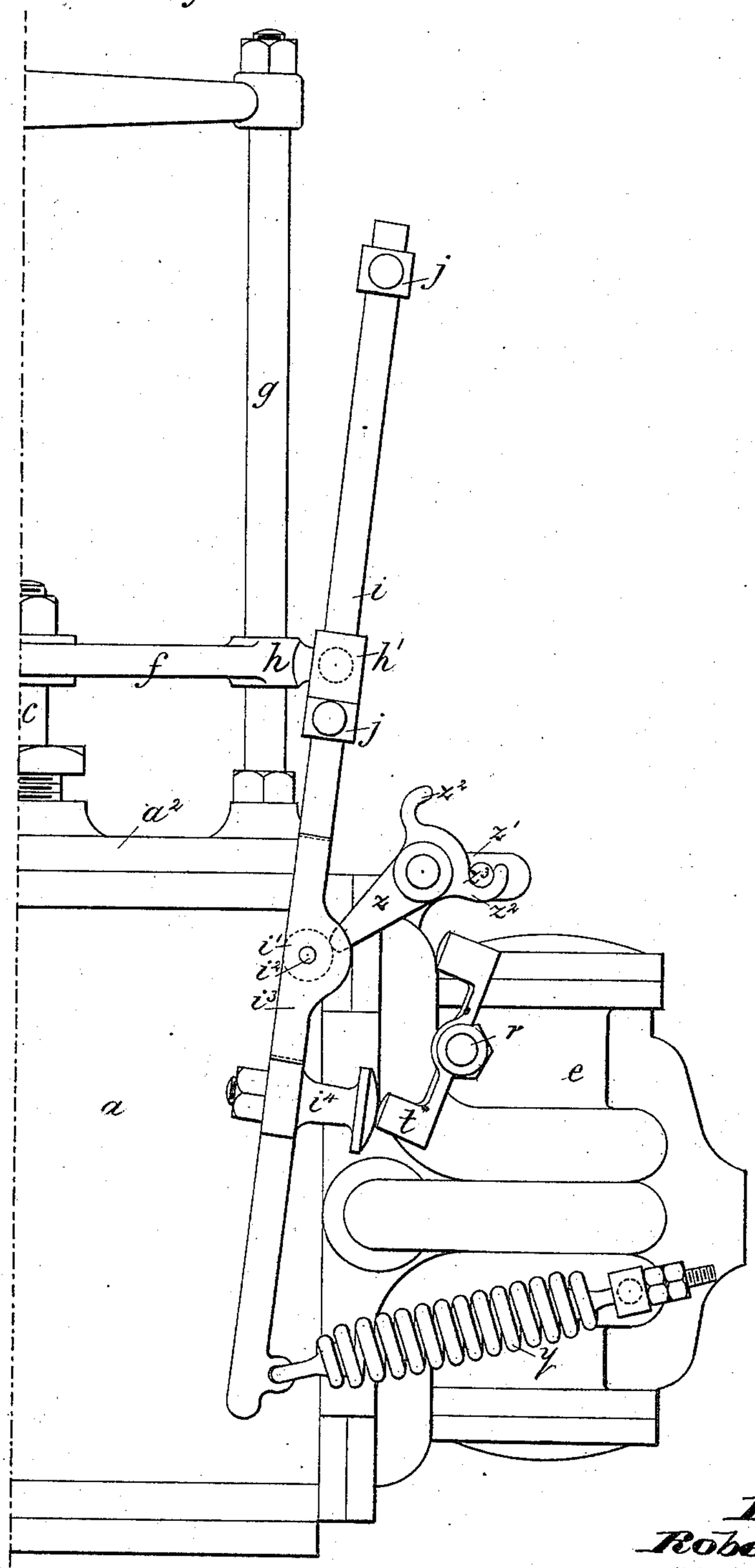


Fig. 8.

Witnesses.
Jo. L. Coombs
Robert Lovett

Inventors.
Robert Fraser,
William Clark.
By James L. Norris.
Atty.

UNITED STATES PATENT OFFICE.

ROBERT FRASER AND WILLIAM CLARK, OF PLUMSTEAD, ENGLAND.

WATER-METER.

SPECIFICATION forming part of Letters Patent No. 309,340, dated December 16, 1884.

Application filed June 28, 1884. (No model.) Patented in England June 7, 1884, No. 8,710.

To all whom it may concern:

Be it known that we, ROBERT FRASER and WILLIAM CLARK, engineers, subjects of the Queen of Great Britain, residing at Plumstead, England, have invented new and useful Improvements in Apparatus for Measuring Water or other Liquids, which apparatus will also serve as a motor, (for which we have applied for provisional protection in Great Britain on the 7th day of June, 1884, No. 8,710,) of which the following is a specification, reference being had to the accompanying drawings.

Our invention relates to apparatus for measuring water or other liquids, which apparatus will, if desired, also serve as a motor.

The chief object of our said invention is to construct a water-meter which will be more simple, durable, and reliable than the meters heretofore employed.

The invention has also for its object to provide novel means for operating the cut-off valve by the movement of the piston-rod.

These objects we accomplish by the combination of devices hereinafter described and claimed.

In the accompanying drawings we have shown how our said invention may be conveniently and advantageously carried into practice.

Figure 1 is a side elevation, Fig. 2 a vertical central section, and Fig. 3 a front elevation, partly in vertical section, showing one form or modification of our water-meter. Fig. 4 is a side elevation, Fig. 5 a plan, and Fig. 6 a section on the line *x x*, Fig. 4, showing another form or modification of the said meter. Fig. 7 is a side elevation showing a further modification thereof, and Fig. 8 is an edge view of part of the same.

Like letters of reference indicate the same parts in the several figures.

a is a cylinder, which may, if desired, be lined with brass or other metal, as shown at *a'*, and which is fitted with a piston, *b*, and piston-rod *c*. This cylinder constitutes the measuring-chamber, and may be placed either vertically or horizontally. In combination with the said cylinder we arrange what we term an "equilibrium and instantaneous cut-off valve" *d*, inclosed in a valve-box, *e*, which, in the apparatus shown in Figs. 1, 2, and 3, is placed on the side of the cylinder *a*, but which may, if desired, be placed on top of the cylinder-cover a^2, as shown in Figs. 4, 5, and 6. The measuring-cylinder has ports or water-passages a^3 at each end, communicating with the valve-box *e*. We fix a cross-head, *f*, on the end of the piston-rod *c*, which cross-head slides upon one or more guide-rods, *g*, fixed in the cylinder-cover a^2. In the apparatus shown in Figs. 1, 2, and 3 one end of the said cross-head is made to project in any suitable direction beyond one of the said guide-rods, as shown at *h*, and has formed in it a hole, into which the rod *i* is fitted to move freely. This rod has two stops, which may consist of adjustable collars *j*, or of lock-nuts *k*, placed at a suitable distance apart, with the said projecting part of the cross-head between them. One end of the rod *i* is connected to a lever, *l*, capable of turning freely upon its fulcrum, and provided with a pin or stud, *m*, projecting from one of its sides. This pin or stud is arranged to come against one or the other of two stops, *n'*, formed on or fixed to a forked or T-shaped lever, *n*, loosely mounted on a central boss or fulcrum, *o*, and arranged to actuate the valve *d*, as hereinafter described. The upper end of the lever *n* is formed with two arms, n^2, extending horizontally in opposite directions, and then curved upward and inward in semicircular form. A weight, *p*, which is preferably V-shaped, is pivoted at its lower end to the center of the lever *n*, and is free to oscillate upon its pivot between the curved arms n^2 of the said lever. The valve *d* is preferably made cylindrical, with a groove or recess, *d'*, to connect either of the cylinder-ports a^3 with the exhaust *q*. The ports or water-passages are sometimes extended around the interior of the valve-box *e*, in the form of semicircular grooves or cavities *e'*, a lining, e^2, of brass or other metal, being fitted in the valve-box and perforated at the parts corresponding with the said grooves or cavities, as shown at e^3. A weigh-shaft or spindle, *r*, is fitted in the valve-box *e*, and has a lever or arm, *s*, fixed upon it and

connected to the valve *d*. A quadrant or segment, *t*, is fixed on the spindle *r*, and is made with two projections or lugs, *t'*, between which the lever *n* is free to oscillate without operating the valve *d*.

The operation of our improved meter is as follows, viz: The action of the water or other liquid upon the piston *b* in either direction causes the projecting end *h* of the cross-head *f* to come into contact with the collar *j* or lock-nuts *k*, and thus carry with it the rod *i* for operating the lever *n*. This lever is first caused to move freely from one to the other of the projections or lugs *t'* on the quadrant or segment *t*. It is then caused to move the said quadrant or segment so that the valve *d* nearly closes the port through which the liquid is entering. By the time the piston *b* has reached the end of its stroke the lever *n* has moved the weight *p* sufficiently to bring its center of gravity from one to the other side of its pivot, so that the said weight falls freely from one to the other of the curved arms n^2 of the lever *n* and rapidly depresses the said lever until the latter strikes a cushion, *u*, which arrests its motion. This movement of the said lever causes the valve *d* to completely cut off the supply of liquid to one end of the cylinder while opening the port communicating with the other end thereof. The cushions *u*, for arresting the motion of the lever *n*, are sometimes formed of pieces of india-rubber or other suitable material carried by bolts *u'*, which are adjustable in a bracket, *v*, fixed to or formed integrally with the cylinder *a* or the valve-box *e*.

The registering mechanism may be of any well-known description, and is usually arranged as shown at *w*, so that it will be operated by the cross-head *f* in its up-and-down or to-and-fro movement.

In the modification of our apparatus shown in Figs. 4, 5, and 6 we employ only one guide-rod, *g*, and the cross-head *f* is made with an extension, *h*, projecting outward from one side of the piston-rod *c*, to actuate the rod *i*.

The construction of the other parts of the apparatus is substantially similar to that of the apparatus shown in Figs. 1, 2, and 3.

We sometimes substitute for the above-described weight a spiral or other spring. An arrangement of this kind is shown in Figs. 7 and 8. In this apparatus the rod *i* is passed through a bush or sleeve, *h'*, pivoted to the extension *h* of the cross-head *f*, and a roller, *i'*, of steel or other suitable metal, is arranged upon a pin, i^2, in a slot, i^3, in the said rod. A spiral spring, *y*, is attached at one end to the rod *i*, and at the other end to the valve-box *e*. The rod *i* is provided with a projection or stud, i^4, for actuating the lever t^*, which is fixed to the spindle *r* and serves as a substitute for the quadrant or segment *t*, above described. A lever, *z*, is pivoted to a bracket, *z'*, fixed to the cylinder *a*, and has two stops, z^2, which, when the apparatus is operating, come alternately against the pin or stud z^3, fixed in the said bracket.

This modification of our apparatus operates as follows—that is to say: When the piston is at the top of its stroke, the lever *z* fits into the slot i^3 beneath the roller *i'*. When the bush or sleeve *h'*, in the downward movement of the said piston, comes against the lower collar, *j*, it presses the rod *i* downward. The roller *i'* then bears upon the lever *z*, which serves as an inclined plane, and causes the lower end of the rod *i* to move to the left until it reaches the position shown in Fig. 7. This movement of the rod *i* expands the spring *y*, and as soon as the roller *i'* passes the end of the lever *z* the said spring contracts and causes the projection or stud i^4 on the rod *i* to act upon the lever t^* and thus operate the valve.

By the combined action of the piston and the weight or spring the instantaneous cut off of the supply of liquid is effected when the piston has reached either end of its stroke, and by the proper adjustment of the parts great accuracy in the measurement of the liquid may be obtained.

By making our apparatus with a considerable length of stroke, as compared with the diameter of the cylinder, it may be used as a motor for actuating an organ-blower; or it may be adapted to serve as a motor for other purposes.

What we claim is—

1. The combination of the cylinder *a*, the piston *b*, having a piston-rod, *c*, the cross-head *f*, fixed on the piston-rod, the movable rod *i*, a sliding connection between the cross-head and the movable rod, the valve-box *e*, the sliding cut-off valve *d* arranged therein, a rock-shaft, *r*, arranged in the valve-box and connected with the valve, devices, substantially as described, actuated by the movable rod for sliding the valve, as and for the purposes set forth.

2. The combination of the cylinder *a*, the piston *b*, having the piston-rod *c*, the cross-head *f*, fixed on the piston-rod, the movable rod *i*, having the separated collars thereon, a sliding connection, *h*, between the cross-head and the movable rod, for alternately striking the said collars to move said rod, the valve-box *e*, the sliding cut-off valve *d*, the rock-shaft *r*, arranged in the valve-box and connected with the valve, and devices, substantially as described, actuated by the movable rod to slide the valve, as and for the purposes described.

3. The combination, with the cylinder *a*, the piston *b* and piston-rod *c*, and the cross-head *f*, having the extension *h*, of the rod *i*, the levers *l* and *n*, the weight *p*, and the quadrant or segment *t*, fixed to the valve-spindle *r*, and provided with the lugs or projections *t'*, substantially as and for the purpose set forth.

4. The combination, with the cylinder *a*,

the piston *b* and piston-rod *c*, and the cross-head *f*, having the extension *h*, of the slotted rod *i*, carried in the bush or sleeve *h'*, and provided with the roller *i'*, and the projection or stud i^4, the lever *z*, having the stops z^2, the lever t^*, fixed to the spindle *r*, and the spring *y*, substantially as described.

In testimony whereof we have hereunto signed our names in the presence of two subscribing witnesses.

ROBERT FRASER.
WILLIAM CLARK.

Witnesses:
JOHN E. BOUSFIELD,
ALFRED WAUGH.